

Aerial Photography

Identification_Information:

Citation:

Citation_Information:

Originator: Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), National Environmental Satellite Data, and Information Service (NESDIS), National Geophysical Data Center (NGDC)

Publication_Date: 20010501

Title: Benthic Habitats of Puerto Rico and the U.S. Virgin Islands; Photomosaic of U.S. Virgin Islands (St. John), 1999

Edition: 1

Geospatial_Data_Presentation_Form: raster digital data

Publication_Information:

Publication_Place: Boulder, CO

Publisher: NOAA's National Geophysical Data Center (NGDC)

Online_Linkage: <http://biogeo.nos.noaa.gov/products/benthic/>

Larger_Work_Citation:

Citation_Information:

Originator: Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), National Centers for Coastal Ocean Science (NCCOS), Center for Coastal Monitoring and Assessment (CCMA), Biogeography Program

Publication_Date: 20011201

Title: Benthic Habitat Maps of Puerto Rico and the U.S. Virgin Islands Prepared by Visual Interpretation from Remote Sensing Imagery Collected by NOAA Year 1999

Edition: 1

Geospatial_Data_Presentation_Form: vector digital data

Publication_Information:

Publication_Place: Silver Spring, MD

Publisher: NOAA's Ocean Service, National Centers for Coastal Ocean Science (NCCOS)

Online_Linkage: <http://biogeo.nos.noaa.gov/products/benthic/>

Description:

Abstract: Habitat maps of Puerto Rico and the U.S. Virgin Islands were created by visual interpretation of aerial photographs using the Habitat Digitizer Extension. Aerial photographs are valuable tools for natural resource managers and researchers since they provide an excellent record of the location and extent of habitats. However, spatial distortions in aerial photographs due to such factors as camera angle, lens characteristics, and relief displacement must be accounted for during analysis to prevent incorrect measurements of area, distance, and other spatial parameters.

These distortions of scale within an image can be removed through orthorectification. During orthorectification, digital scans of aerial photos are subjected to algorithms that eliminate each source of spatial distortion. The result is a georeferenced digital mosaic of several photographs with uniform scale throughout the mosaic. Features near land are generally georeferenced with greater accuracy while the accuracy of features away from land is generally not as good. Where no land is in the original photographic frame only kinematic GPS locations and image tie points were used to georeference the images. After the orthorectified mosaics were

created, photointerpreters were able to accurately and reliably delineate boundaries of features in the imagery as they appear on the computer monitor.

Purpose: The National Ocean Service is conducting research to digitally map biotic resources and coordinate a long-term monitoring program that can detect and predict change in U.S. coral reefs, and their associated habitats and biological communities.

Time_Period_of_Content:

Time_Period_Information:

Multiple_Dates/Times:

Single_Date/Time:

Calendar_Date: 199902

Single_Date/Time:

Calendar_Date: 199903

Single_Date/Time:

Calendar_Date: 199912

Currentness_Reference: publication date

Status:

Progress: Complete

Maintenance_and_Update_Frequency: none planned

Spatial_Domain:

Bounding_Coordinates:

West_Bounding_Coordinate: -64.82

East_Bounding_Coordinate: -64.64

North_Bounding_Coordinate: 18.38

South_Bounding_Coordinate: 18.29

Keywords:

Theme:

Theme_Keyword_Thesaurus: none

Theme_Keyword: coral

Theme_Keyword: seagrass

Theme_Keyword: SAV

Theme_Keyword: reef

Theme_Keyword: aerial photography

Theme_Keyword: benthic

Theme_Keyword: habitat

Theme_Keyword: mangrove

Theme_Keyword: oceans

Theme_Keyword: coral reef conservation

Theme_Keyword: coastal ecosystem science

Theme:

Theme_Keyword_Thesaurus: CoRIS Theme Thesaurus Version 1

Theme_Keyword: Coral reef > Coral reef monitoring and assessment > Remote sensing

Theme_Keyword: EARTH SCIENCE > Biosphere > Zoology > Corals > Reef monitoring and assessment > Remote sensing

Theme_Keyword: Mapping > Base map > Aerial photography

Theme_Keyword: EARTH SCIENCE > Biosphere > Zoology > Corals > Reef monitoring and assessment > Coral Reef Mapping > Base map > Aerial photography

Theme:

Theme_Keyword_Thesaurus: CoRIS Discovery Thesaurus Version 1

Theme_Keyword: Map Images > Aerial Photographs

Place:

Place_Keyword_Thesaurus: None

Place_Keyword: U.S. Virgin Islands

Place_Keyword: St. John

Place:

Place_Keyword_Thesaurus: Coris Place Thesaurus Version 1

Place_Keyword: OCEAN BASIN > Atlantic Ocean > Caribbean Sea > Virgin Islands > Virgin Islands > St. John (18N064W0011)

Place_Keyword: COUNTRY/TERRITORY > United States of America > US Virgin Islands > St. John > St. John (18N064W0011)

Access_Constraints: none

Use_Constraints: none

Point_of_Contact:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), National Centers for Coastal Ocean Science (NCCOS), Center for Coastal Monitoring and Assessment (CCMA), Biogeography Program

Contact_Position: Biogeography Team Leader, Mapping Manager

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Address_Type: mailing and physical address

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Hours_of_Service: 0800-1700, Monday to Friday, EST

Data_Set_Credit: National Geophysical Data Center

Native_Data_Set_Environment: MrSID Compression, orthorectified aerial photos

Data_Quality_Information:

Logical_Consistency_Report: Once all of the photographs were orthorectified, the best segments of each photograph were selected for creation of the final mosaic. Segments of each photograph were selected to minimize sun glint, cloud interference, and turbidity in the final mosaic. Where possible, parts of images obscured by sun glint or clouds were replaced with cloud/glint free parts of overlapping images. As a result, most mosaics have few or no clouds or sun glint obscuring bottom features.

Completeness_Report: No color balancing was attempted since this alters color and textural signatures in the original imagery and interferes with the photointerpreter's ability to delineate habitats. As a result mosaics have visible seams between adjacent photos. This provides the photointerpreter with "true color" imagery for maximum ability to identify and delineate benthic features.

Positional_Accuracy:

Horizontal_Positional_Accuracy:

Horizontal_Positional_Accuracy_Report: Horizontal accuracy was determined by solution of Socet Set generated model (RMS less than 1) and by comparison to independent ground control data. $x=1.4 \pm 1.3$, $y=1.1 \pm 3.4$ values are in meters \pm standard deviation

Lineage:

Source_Information:

Source_Citation:

Citation_Information:

Originator: National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), National Geodetic Survey (NGS)

Publication_Date: 1999

Title: National Geodetic Survey Aerial Photography of Puerto Rico and

the U.S. Virgin Islands, 1999

Edition: 1

Geospatial_Data_Presentation_Form: raster digital data

Publication_Information:

Publication_Place: Silver Spring, MD

Publisher: NOAA's Ocean Service, National Geodetic Survey (NGS)

Online_Linkage: <http://biogeo.nos.noaa.gov/products/data/photos/usvi.shtml>

Source_Scale_Denominator: 48000

Type_of_Source_Media: aerial photography and scanned photos

Source_Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Calendar_Date: 1999

Source_Currentness_Reference: publication date

Source_Citation_Abbreviation: NOAA/NOS/NGS Aerial Photos

Source_Contribution: NOS aerial photos were used to create orthophoto mosaics

Process_Step:

Process_Description: Aerial photographs were acquired for Puerto Rico and the U.S. Virgin Islands Benthic Mapping Project in 1999 by NOAA Aircraft Operation Centers aircraft and National Geodetic Survey cameras and personnel.

Approximately 600, color, 9 by 9 inch photos were taken of the coastal waters of Puerto Rico and the U.S. Virgin Islands at 1:48000 scale. Specific sun angle and maximum percent cloud cover restrictions were adhered to when possible during the photography mission to ensure collection of high quality imagery for the purpose of benthic mapping.

Print and diapositives were created from the original negatives.

Diapositives were then scanned at a resolution of 500 dots per inch (DPI) using a metric scanner, yielding 2.4 by 2.4 meter pixels for the 1:48000 scale photography. All scans were saved in TIFF format for the purposes of orthorectification and photointerpretation.

Georeferencing/mosaicing of the TIFF's was performed using Socet Set Version 4.2.1. Lens correction parameters were applied to each frame to eliminate image distortion. Airborne kinematic GPS was then used when available to provide a first order geolocation. When this information was not available, measurements were made between flightline strips for input into Socet Set to provide preliminary co-registration.

Image to image tie-points were then used to further co-register the imagery, especially for photos taken over open water where ground control points were not available. Fixed ground features visible in the scanned photos were selected for ground control points (GCP's) which were then used to georeference the imagery. GCP's were measured using real-time DGPS (differential Global Positioning System). Points were obtained with a wide distribution throughout the imagery, especially on peninsulas and outer islands whenever possible since this results in the most accurate registration throughout each image. Only ground control points for terrestrial features were collected due to difficulty of obtaining precise positions for submerged features.

A custom digital terrain model (DTM) was then created using the Socet Set software to correct for feature displacement due to terrain effects. To accomplish this, water features and the shoreline were set to an elevation of zero. Preliminary experimentation revealed that the effects of refraction on the position of submerged features

in the imagery were not significant enough to make a correction for underwater displacement according to Snell's law. Selected land elevation points were then inserted from USGS 1:24000 Digital Elevation Models or other elevation data sets where clouds or other sources of interference prevented the Socet Set software from automatically making an accurate DTM.

Once the terrain models were complete and a draft orthorectified mosaic was produced, a set of independent ground control points was used to measure the quality of each mosaic's rectification and ensure that it met acceptable limits of horizontal spatial accuracy. If spatial accuracy was not acceptable based on this comparison, additional modifications were made, until a satisfactory mosaic was created for each island. In general, mosaics were georeferenced such that pixels are positioned within one pixel width of their correct location.

Process_Date: 2000

Process_Contact:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), National Ocean Service (NOS), National Centers for Coastal Ocean Science (NCCOS), Center for Coastal Monitoring and Assessment (CCMA), Biogeography Program

Contact_Position: Biogeography Team Leader, Mapping Manager

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Hours_of_Service: 0800-1700, Monday to Friday, EST

Cloud_Cover: 2

Spatial_Data_Organization_Information:

Direct_Spatial_Reference_Method: Raster

Spatial_Reference_Information:

Horizontal_Coordinate_System_Definition:

Planar:

Map_Projection:

Map_Projection_Name: Transverse Mercator

Transverse_Mercator:

Scale_Factor_at_Central_Meridian: 0.9996

Longitude_of_Central_Meridian: -63

Latitude_of_Projection_Origin: 0

False_Easting: 500000

False_Northing: 0

Planar_Coordinate_Information:

Planar_Coordinate_Encoding_Method: Coordinate Pair

Coordinate_Representation:

Abscissa_Resolution: 2.4

Ordinate_Resolution: 2.4

Planar_Distance_Units: meters

Geodetic_Model:

Horizontal_Datum_Name: North American Datum of 1983

Ellipsoid_Name: Geodetic Reference System 80

Semi-major_Axis: 6378137

Denominator_of_Flattening_Ratio: 298.257

Entity_and_Attribute_Information:

Overview_Description:

Entity_and_Attribute_Overview: Pixel values are MrSID compressions.

Data were originally geoTIFF format.

Entity_and_Attribute_Detail_Citation: MrSID Compressed orthorectified images; UTM Zone 20.

Distribution_Information:

Distributor:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: National Atmospheric and Oceanic Administration (NOAA), National Ocean Service (NOS), National Centers for Coastal Ocean Science (NCCOS), Center for Coastal Monitoring and Assessment (CCMA), Biogeography Program

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Resource_Description: Downloadable Data

Distribution_Liability: Data are not to be used for navigation.

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Standard_Order_Process:

Digital_Form:

Digital_Transfer_Information:

Format_Name: MrSID

Digital_Transfer_Option:

Online_Option:

Computer_Contact_Information:

Network_Address:

Network_Resource_Name: <http://biogeo.nos.noaa.gov/products/benthic/htm/data.htm>

Fees: None

Metadata_Reference_Information:

Metadata_Date: 20030703

Metadata_Review_Date: 20030703

Metadata_Contact:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), National Centers for Coastal Ocean Science (NCCOS), Center for Coastal Monitoring and Assessment

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Metadata_Standard_Name: FGDC Content Standard for Digital Geospatial
Metadata

Metadata_Standard_Version: FGDC-STD-001-1998